

WHAT IS CLAIMED IS:

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5 A method for performing cell based operations identifying single cell status, employing a microfluidic device having a reservoir containing cells for said cell based operations, said reservoir containing an appropriate viable cell supporting medium, a first capillary channel in fluid transfer relationship with said reservoir, an electroosmotic pump comprising a second capillary channel in fluid receiving relationship with said first channel, an electrokinetic medium in said second capillary channel and a pair of electrodes for creating an electrical field in said
10 electrokinetic medium for moving electrokinetic medium in said second channel, and a detector, said method comprising:

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15 at least prior to adding said cells to said reservoir, contacting said cells with an agent that affects the status of said cells;

applying an electrical field to said electrokinetic medium in said second capillary channel in a direction to remove liquid from said first channel, whereby cells move from said reservoir into said first channel;

20 continuing removal of liquid from said first channel while moving said cells to the site of said detector; and

determining the effect of said agent on the status of said cells.

25 2. A method according to Claim 1, wherein said cells are contacted with a compound of interest and a labeled ligand which competes with the compound of interest for binding to a cell receptor, and said determining is measuring the amount of labeled ligand bound to said cell.

30 3. A method according to Claim 1, wherein said agent is contacted with said cells after said cells leave said reservoir.

24. A method according to Claim 1, wherein said cells are fixed cells.

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A method according to Claim 1, wherein said cells are viable cells.

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5 A method according to Claim 1, wherein said viable cell supporting medium is isotonic for said cells by the addition of a neutral osmolality enhancing agent to provide an osmolality in the range of about 250 to 350 mOsm.

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A method for performing cell based operations identifying single cell status, employing a microfluidic device having a reservoir containing cells for said cell based operations, said reservoir containing an appropriate viable cell supporting medium, a first capillary channel in fluid transfer relationship with said reservoir, an electroosmotic pump comprising a second capillary channel in fluid receiving relationship with said first channel, an electrokinetic medium in said second capillary channel and a pair of electrodes for creating an electrical field in said electrokinetic medium for moving electrokinetic medium in said second channel, and a detector, said method comprising:

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20 applying an electrical field to said electrokinetic medium in said second capillary channel in a direction to remove liquid from said first channel, whereby cells move individually from said reservoir into said first channel;

adding by electrokinetic means into said first channel a compound of interest to contact said cells;

25 moving said cells to the site of said detector; and

determining the effect of said compound on the status of said cells.

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30 A method according to Claim 7, including the additional step of adding a labeled ligand by electrokinetic means into said channel to contact said cells, wherein said labeled ligand binds to a cell surface receptor of said cells, and said determining comprises detecting the presence of said labeled ligand.

9. A method according to Claim ~~8~~³⁵, wherein said labeled ligand is a fluorescently labeled ligand and said detector is a fluorimeter.

10. A method according to Claim ~~7~~⁵, wherein said cells are genetically modified to produce a detectable product upon binding of a ligand to a cell surface receptor, and said determining comprises detecting the production of said detectable product.

11. A method according to Claim ~~7~~⁵, wherein said applying moves said cells by electroosmotic pumping, said pumping employing two legs of a channel, with each leg pumping liquid in an opposite direction, and an electric field is absent in the portion of the channel in which said cells are moved.

12. A method according to Claim ~~11~~⁸, wherein said cells are in a physiological medium.

13. A method according to Claim ~~7~~¹⁵, wherein said agent is an antagonist and said determining is as a result of variation in signal by cells displacing in said conductive medium a fluorescent agent binding to said cells.

14. A method for performing cell based operations identifying single cell status, employing a microfluidic device having a reservoir containing fixed cells for said cell based operations, a capillary channel in fluid transfer relationship with said reservoir, a pair of electrodes for creating an electrical field in a conductive medium for moving cells in said channel and a detector, said method comprising:

at least prior to adding said cells to said reservoir, contacting said cells with an agent that affects the status of said cells;

applying an electrical field to said conductive medium in said capillary channel, whereby cells individually move from said reservoir into said channel;

moving said cells to the site of said detector; and

determining the effect of said agent on the status of said cells.

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A method according to Claim 14, wherein said applying moves said cells electrophoretically and said channel comprises an electrophoretic medium containing less than 1% of a polymer matrix.

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Sub 0.12 } 16. A method according to Claim 14, wherein said compound of interest is contacted with said cells in said channel.

Sub an } 17. A method according to Claim 14, wherein said compound of interest is labeled with a detectable label.

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A method according to Claim 14, wherein said agent is an antagonist and said determining is as a result of variation in signal by cells displacing in said conductive medium a fluorescent agent binding to said cells.

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